FIRST STUDIES ON THE HEALTH AND GROWTH OF THE BENGALEE STUDENTS

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TO

SIR NILRATAN SIRCAR, KT., M.A., M.D., LL.D., D.C.L.

PREFACE

For sometime past I have been thinking of publishing in a handy form the large volume of data collected by the Students' Welfare Scheme of the University of Calcutta. The materials which have been sifted and arranged with care are now ready and they have been embodied in part in the present work. They bear upon a variety of questions on the Student and Student Life in and about Calcutta. The difficulty of choosing from this vast collection subjects which will interest the public and be at the same time of scientific or social value was very great. It is for my readers to judge how far I have succeeded in my endeavours. For the opinions expressed in the book I am alone responsible. They are not to be taken as the views of the Students' Welfare Committee or of the University of Calcutta.

To Sir Nilratan Sircar, Kt., but for whose encouragement and appreciation the work would not have seen the light, my obligation is too great for words.

My thanks are due to my beloved colleagues, Mr. Sailendra Nath Mitra, M.A., of the Pali Department and Mr. Debipada Banerjee, M.B., After-care Officer, Students' Welfare Committee, for the help they have given me in the preparation and publication of the volume.

I would further like to record here my appreciation of the disinterested efforts of Mr. Kalidas Banerjee, M.A., B.L., Mr. Janaki Nath Mukherjee, Mr. Sailendra Nath Chatterjee, B.A., and Mr. Subal Chandra Saha, Assistants, Students' Welfare Office, to facilitate my investigations.

I am deeply beholden to the University authorities and to Mr. Jogesh Chandra Chakravorti, M.A., Asst. Registrar, for the arrangements they have made for the publication of the book.

Lastly, I am immensely obliged to Mr. Atulchandra Ghatak, M.A., Superintendent, and Mr. Bhupendralal Banerjee of the Calcutta University Press, for the interest they have taken in seeing the book through the press.

STUDENTS' WELFARE OFFICE,
Darbhanga Buildings,
December 1, 1932.

A. CHATTERJEE.

CONTENTS

FIRST STUDIES ON THE HEALTH AND GROWTH OF THE BENGALEE SCHOOL AND COLLEGE STUDENTS

INTRODUCTION.

Systematic studies regarding the growth and development of the School Child have been carried out in England and on the Continent, in Japan and the United States of America for a number of decades. A large volume of data have been accumulated and the normals, for the different age-groups, of criteria for measuring physical growth of these children have been worked out for the guidance of the school doctor, the school teacher, and the social worker. Similar figures for the Bengalee students were not available even as far back as 1925 before the publication of the 'Annual Reports' on the Students' Welfare Scheme. Unfortunately the respective figures are scattered through a number of these reports and are not easily available for reference and some useful purpose will be served by collecting these materials and publishing them in a handy form. It will give the school medical officer a standard by means of which he will be able to judge whether a student is underweight for his age, or stunted in height and whether he is above or below the Bengalee average in his physical growth. It will also give the social worker figures by means of which he will be able to compare the Bengalee child with the children of other races, and determine the particular problem about growth and development which require further investigation for their elucidation or for the improvement of the general physique of the Bengalees as a nation.

CHAPTER I.

On the determination of the Norms for the Average Bengalee College Student.

Various criteria have been used for measuring growth by different workers in different countries. The measurements chosen by the Students' Welfare Scheme are the following :—height, weight, chest inspiration, chest expiration, chest expansion, vital capacity, strength of grip, right hand and left hand, and girth of biceps and from these are calculated two indices which have proved of great value in judging nutrition, *viz.*, Ponderal Index and Oppenheimer's Index. The figures for these measurements between the ages 7-24 are given in the following table :—

Table 1.

Age	Height in inches.	Weight in lbs.	Ponderal Index.	Chest Inspiration in cm.	Chest Expiration in cm.	Chest Expansion in cm.	Strength of Grip in kilos.		Girth of Biceps in cm.	Vital Capacity in litres.
							Right	Left.		
7	47·6	48	2·35	87·5	54·1	3·4	9·8	9·6	...	...
8	48·5	49	2·31	89·2	55·7	3·5	11·1	10·1	...	...
9	50·3	53	2·29	60·9	57·2	3·7	12·4	11·1	...	...
10	52·5	56·7	2·27	63·1	59·4	3·7	14·2	12·9	...	...
11	54·1	63·1	2·25	65	60·1	4·9	15·7	14·1	...	...
12	56·6	70·2	2·24	67·6	63·2	4·4	17·9	16·5	...	...
13	58·2	78·5	2·24	70·2	65·8	4·4	21·3	19·2	...	...
14	61·3	86·2	2·23	73·4	68·9	4·5	24·7	22·1	...	...
15	64·6	103·4	2·23	77·8	73·1	4·7	32·4	30·3	21·8	...
16	65·6	107·8	2·23	81	76·3	4·7	36·4	33·4	22·4	2·55
17	66·1	110	2·23	82·3	77·7	4·6	37·7	35	22·9	2·69
18	66·4	112	2·23	82·9	78·3	4·6	38·2	36·2	23·0	2·72
19	66·4	112·9	2·23	83·2	78·6	4·6	39·8	36·8	23·4	2·72
20	66·3	114·4	2·24	83·7	79	4·7	40·2	37·1	23·7	2·79
21	66·7	115·5	2·24	84·3	79·7	4·6	40·5	37·6	23·9	2·87
22	66·2	116	2·25	84·1	79·9	4·2	40·4	37·2	23·5	2·95
23	66·1	114·4	2·25	84·2	79·8	4·4	39·9	37·2	23·8	2·85
24	66·4	117·7	2·27	85·1	80·6	4·5	40·2	37·1	23·3	2·98

From a consideration of the above table based on the measurements of over 20,000 students, the following normals for the average Bengalee college student at 19 have been worked out :—

Height	...	...	166·05 cm. (66·4″)
Weight	...	...	49·9 kg. (112·9 lbs.)
Ponderal Index	...	...	2·23
Chest Inspiration	...	...	83·2 cm. (33·8″)
Chest Expiration	...	...	78·6 cm. (31·5″)
Chest Expansion	...	...	4·6 cm. (1·8″)
Vital capacity	...	...	2·72 litres.
Girth of Biceps	...	...	29·4 cm.
Grip, Right	...	...	30·8 kilos.
Grip, Left	...	...	36·8 kilos.

Taking the above figures as standards of development I have compared the figures in the different colleges in and about Calcutta, and have come to the conclusion that for all practical purposes, the physical development of the students of the different colleges is of the same standard, save and except the fact that the Muhammadan student appears to be of a slighter build and less robust than his fellow students.

Effect of exercise on general growth.

To study the effect of exercise on the general growth and health of the college students the Students' Welfare Committee arranged for a thorough enquiry in 1928. The records of those students who took exercise regularly were separately analysed. The averages and percentages obtained were compared with (*a*) the averages and percentages for the students of the same college who do not take exercise and (*b*) the general averages and percentages for all students. The results are given in the following table :—

TABLE 2.

E=Easterns. R=The Rest.

	Scottish Church College Hostels.		Presidency College.		City College.		Islamia College.		Total.	
	E.	R	E	R	E	R	E	R	E	R
Height ...	166·11 cm.	167·15 cm.	167·45 cm.	167·81 cm.	166·01 cm.	166·70 cm.	163·55 cm.	164·84 cm.	165·79 cm.	166·38 cm.
Weight ...	47·67 kg.	50·32 kg.	53·54 kg.	52·74 kg.	51·67 kg.	51·02 kg.	49·38 kg.	49·09 kg.	53·54 kg.	51·45 kg.
Chest Expansion	4·03 cm.	4·89 cm.	5·06 cm.	4·80 cm.	5·08 cm.	5·04 cm.	4·07 cm.	4·33 cm.	4·78 cm.	4·75 cm.
Grip (right) ...	41·14 k.	38·71 k.	42·64 k.	40·93 k.	43·73 k.	37·30 k.	39·38 k.	39·60 k.	41·11 k.	39·81 k.
Grip (left) ...	38·05 k.	35·61 k.	39·35 k.	37·54 k.	37·23 k.	36·53 k.	35·0 k.	35·19 k.	37·67 k.	36·70 k.

We find that in the Presidency College regular exercisers show a definite superiority over the rest, whereas in the Islamia College it seems to be the other way about This is probably due to the different economic conditions of the students of the two Colleges, and is a point in favour of that school of thought which advocates the introduction of compulsory school tiffin before the introduction of compulsory physical exercise

Effect of economic status on general growth

Investigating the influence of economic condition on the health and development of the student, one is confronted at the very outset with the difficulty of determining the economic condition of the students' family. Occupation is usually taken as the criterion of the economic status of a family, but one is likely to be misled by this criterion alone, if one does not definitely know the approximate income behind the occupation given. To guard against this source of error a comparison has been made of two groups of students, the incomes of whose families were roughly known In the absence of better descriptive terms these two groups have been termed, the "Well-conditioned Group" and the "Ill-conditioned Group" Under the former group the following occupations have been mostly represented :—Attorneys, Barristers, Vakils, Merchants, Gazetted Government Officers, Zamindars and Medical Practitioners ; and in the second group are included professions like that of Clerks, School teachers, Naibs, etc. The detailed tables for the two groups are shown in the report of the Students' Welfare Committee for the year 1929, and for reasons of space I have refrained from repeating them here. The following tables summarise the main differences between the two groups as regards health and development.

TABLE 3A.

Development.

Criteria	Well-conditioned Group	Ill-conditioned Group
Height	166·8 cm.	164·6 cm.
Weight	53·6 kg.	49·9 kg.
Pelvic Index	2·36	2·31
Chest girth at rest	84·3 cm.	83·4 cm.
Chest girth at expiration	5·70 cm.	5·40 cm.
Lung Capacity	3·4 lt.	3·1 lt.
Grip [illegible]	35·3 k.	35·1 k.

TABLE 3B.

Incidence of Defects and Diseases

Criteria	Well-conditioned Group.		Ill-conditioned Group.	
	Percentage		Percentage	
Malnutrition	2·7		4	
Caries	5		7	
Defective vision	11		5	
Diseases of throat	4		8	
Diseases of Cardiovascular system ...	4		11	
Rheumatism	2·1			

From the above summary it is obvious that the students from the well-conditioned families are better developed. The number of students suffering from malnutrition is also lower in them. But it is not to be supposed that all the advantages are necessarily on the side of the students from the better-conditioned families. They suffer more from defective vision, bad throat, caries and obesity.

This finding again lends support to that school of thought, which advocates the introduction of compulsory tiffin in schools, before the introduction of compulsory physical education.

CHAPTER II.

On the determination of the State of Nutrition: Nutritional Indices

"Nutrition, it must be remembered, is not an alternative term for food, which is but one of the causes of malnutrition. Nutrition consists in the total well-being and right functioning of the whole body. Malnutrition is the opposite, and if the body be ill-nourished and below par, the mind and spirit of the student are by that much injured or impaired and its total capacity reduced."*

What constitutes a good standard of general nutrition, is a question of great difficulty of determination. The medical examiner has to weigh facts he has collected at the medical examination, fix a standard in his own mind, and compare every case with it to settle in what class a particular student should be placed. But as the standard is not fixed there is bound to be striking dissimilarities in the data according to the standard adopted by each individual examiner. The figures obtained by this method by the medical examiners attached to the Students' Welfare Scheme were as follows:—

Fatty	8·4 %
Muscular	6·8 %
Medium	63 %
Thin	22 %

I have tried to determine whether a standard can be fixed or not, and have tested the values of the following formulae in the estimation of nutrition (1) Ponderal Index, and (2) Oppenheimer's Index.

* Vide Annual Report of the Chief Medical Officer of the Board of Education for 1922, p. 67.

Ponderal Index represents the percentage value of the cube root of weight in kilos divided by the stature in cm.

$$P.I. = \frac{\text{wt in kilos} \times 100}{\text{ht in cm}}$$

In other words, it gives the weight of a cm. of height in grammes. In calculating Ponderal Index the metric instead of the English system is used for reasons which are obvious. The calculation is undoubtedly complicated but it gives a due adjustment for abnormal weight.

The figures for Ponderal Index of the Bengalee students calculated from the measurements of 18,600 students are as follows :—

TABLE 4.

Frequency Distribution of Ponderal Index

Epoch	No.	Percentage.	Classification.
Below 2·1875	1	0·01	Greatly under weight
2·1876-2·2125	211	1·13	Marked malnutrition
2·2126-2·2375	4618	24·82	Malnutrition including under nourished
2·2376-2·2625	5270	28·32	Average nutrition
2·2626-2·2875	3881	20·85	Fair nutrition
2·2876-2·3125	1880	10·1	Good nutrition
2·3126-2·4375	725	3·89	Stout.
Above 2·4375	64	0·35	Greatly over weight

The calculated average of the Ponderal Index is 2·24 with a standard deviation of ±0·098. The probable error is ±0·065 and I have adopted this as the epoch in my classification to enable me to roughly correlate the data

obtained by physical inspection and the figures obtained by calculation The results are shown side by side in the following table :—

TABLE 5.

Classification by Inspection	Percentage by Ponderal Index	Percentage by Inspection
Thin	[illegible]	22
Medium	[illegible]	63
Muscular	[illegible]	5 8
Stout	7 4	8 6

It will be seen that whereas the figures for the groups "Muscular" and "Stout" agree closely in both cases, there is a considerable discrepancy in the figures for the two groups "Moderate" and "Thin" This is due to the difficulty in drawing a distinct line of demarcation between the average and the poorly nutritioned student. A very large group of students, in this case 1,868 (26 0 per cent.), falls under the head "Border-line cases," or cases which are below the average but not sufficiently ill-developed to be frank cases of mal-nutrition.

The factors which may affect Ponderal Index are age, race and caste, economic condition, exercise and diet. In the following paragraphs I shall attempt to determine how much the above factors affect the Ponderal Index.

The average of the different age groups as obtained by me from an analysis of the data from nearly 24 000 students is as follows :—

TABLE 6.

Age	Ponderal Index	Age	Ponderal Index
7	[illegible]	15	2 23
8	[illegible]	16	[illegible]
9	[illegible]	17	[illegible]
10	2 27	18	[illegible]
11	2 25	19	[illegible]
12	2 24	20	2 24
13	2 25	21	2 24
14	[illegible]	22	2 25

The nature of the Ponderal Index is such that beginning from a high level during childhood it continues to fall at a variable rate till about the 15th year of life, then it begins to increase and continues to rise well into mature life. This phenomenon makes it difficult for the general adoption of this Index as a criterion of nutrition throughout the school and college career of the students. The variations during the ages during which the average Bengalee student attends college, viz., 17-21, fall within the epoch adopted for our classification and hence do not materially affect our conclusions.

Under this head I propose to study the variations of Ponderal Index as met with in various races.

Race and Caste.

TABLE 7.

A. European Races.

		Ponderal Index	
1	Norwegians	2·34	Calculated from figures given in Martin's *Lehrbuch der Anthropologie.*
2	Polish Jews	2·38	
3	Bulgarians	2·37	
4	Germans	2·37	
5	Dutch	2·37	
6	English	2·38	
7	Swiss	2·40	
8	South Russian Jews	2·39	

B. Asiatic Races.

1	Bengalee Muhammadan students	2·20	From figures published by the Students' Welfare Committee, Calcutta University.
2	" lower caste "	2·21	
3	" Vaidya "	2·22	
4	" Kayastha "	2·23	
5	" Brahmin "	2·23	
6	Mysore students	2·25	From figures supplied by the Mysore University.

		Ponderal Index	
7.	Lower caste Hindus	2·25	Calculated from figures in Martin's *Lehrbuch der Anthropologie.*
8.	Javanese	2·25	
9.	Higher caste Hindus	2·26	
10.	South Chinese	2·29	
11.	Melanesians	2·30	
12.	Annamese	2·33	
13.	Koreans	2·35	
14.	Japanese	2·37	
15.	North Chinese	2·38	

C. Other Continents.

1.	Bushmen	2·37	Data
2.	Maori	2·37	
3.	Red Indians	2·43	

The above table indicates that the Indians as a whole have a lower Ponderal Index than any of the races enumerated above In this respect they are approached by the Javanese, Melanesians and South Chinese, and to some extent by the Annamese, i.e., the inhabitants of South Eastern Asia seem to form a group by themselves independently of racial or ethnic factors. Therefore I am led to suppose that Ponderal Index is independent of racial influence, and the differences noticed are probably due to climatic conditions, differences in diet, or to the mode of life adopted. The South Asiatic races which I have grouped together all live within the region under the influence of the monsoons, and are mainly rice-eaters, and it may well be that these two factors have something to do with the lowering of the Ponderal Indices of these people

I have in Chapter I worked out in detail the differences in physical standard between students from "well-conditioned families" and "ill-conditioned families" The Ponderal Indices for the

Environment: food and exercise.

groups are respectively 2·26 and 2·24. The figures for exercisers and non-exercisers are 2·26 and 2·24 respectively. Therefore it appears that economic condition and exercise also affect Ponderal Index. The differences though small appear to be significant.

Diet

An enquiry into the dietetic habits of the students was undertaken by the Students' Welfare Scheme in 1930 as a part of the routine examination. And each student was asked to state the articles of food he usually took in his diet together with their approximate quantities. A detailed analysis of the data will be given in the chapter on Diet. For investigating the influence of diet on Ponderal Index, the students were classified according to the incidence of milk and wheat (*atta*) in their diet into the following classes

Class I—Students who do not take milk and wheat

Class II—Students who take wheat but not milk.

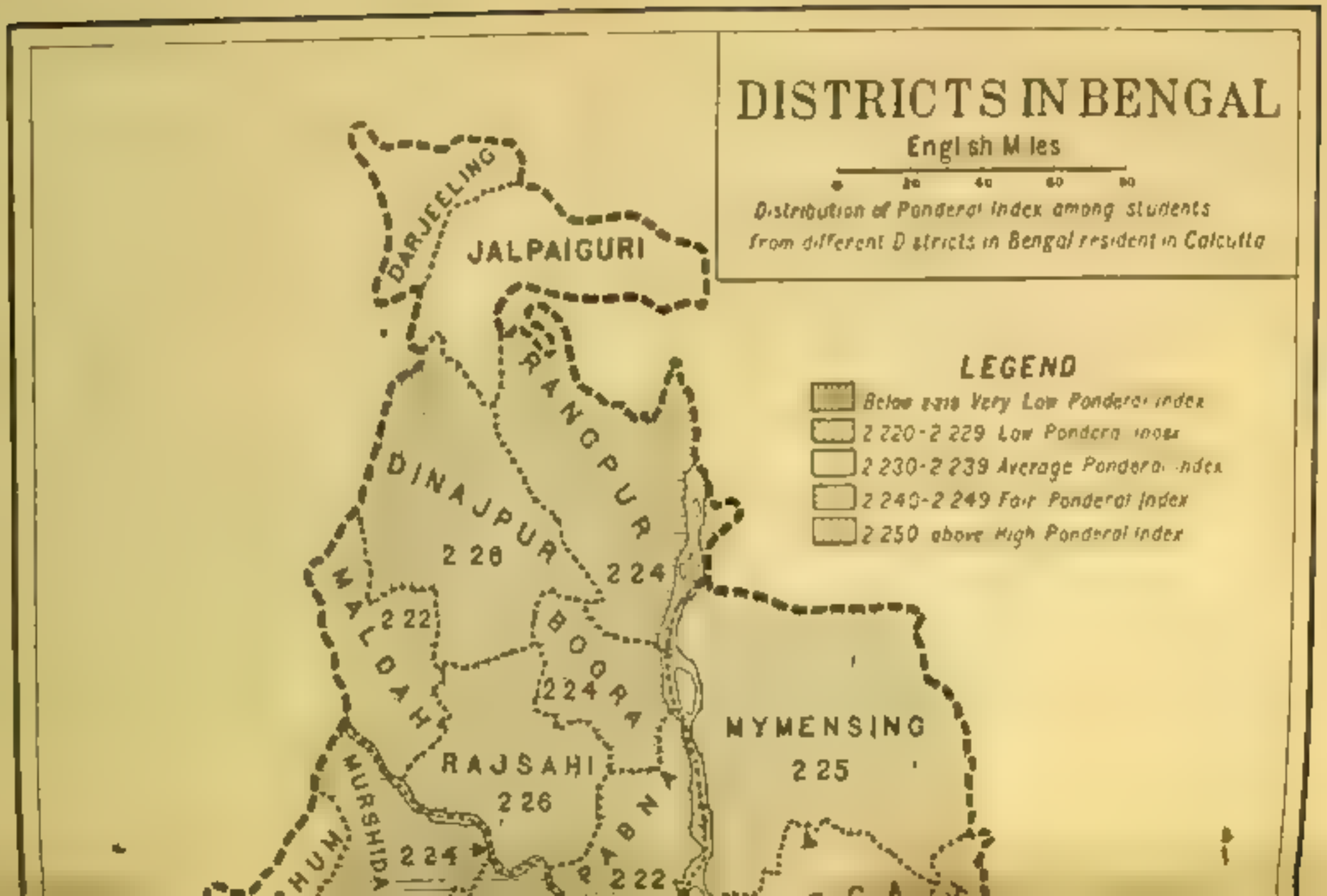
Class III—Students who take milk but not wheat

Class IV Students who take both

In the following table is given the average Ponderal Index for each group:—

TABLE 8.

	Class I without milk and wheat	Class II with wheat only	Class III with milk only	Class IV with both
No. of students	838	341	100	190
Ponderal Index	2·232	2·248	2·276	2·261


DISTRICTS IN BENGAL
English Miles
0 20 40 60 80
Distribution of Ponderal Index among students from different Districts in Bengal resident in Calcutta
LEGEND
Below 2.219 Very Low Ponderal Index
2.220-2.229 Low Ponderal Index
2.230-2.239 Average Ponderal Index
2.240-2.249 Fair Ponderal Index
2.250 above High Ponderal Index
DARJEELING
JALPAIGURI
RANGPUR
224
DINAJPUR
228
MALDAH
222
BOGRA
224
RAJSAHI
226
MURSHIDA
224
PABNA
222
MYMENSING
225


BIRBHUM
223
BARDWAN
224
BURDWAN
224
222
BANKURA
HOOGHLY
223
MIDNAPORE
25
HOWRAH
222
24 PARGANAS
221
2·23
JESSORE
225
KHULNA
222
FARIDPUR
225
BARISAL
TIPPERAH
227
NOAKHALI
224
CHITTAGONG
222

From the above table it will be seen that milk in diet seems to play an important part in the building up of the body and in the prevention of malnutrition and cannot be replaced by wheat.

Wheat also furthers the growth of the body, but the combination of both secures the best results The average low Ponderal Index of the Bengalee student is partly due to the absence of these two essential articles of food in their diet The percentage of students taking milk in sufficient quantity is 17 only. I will close the consideration of Ponderal Index with a survey of the distribution of this Index in the different districts of Bengal

The distribution shows a low Ponderal Index for the Districts of Midnapur, Howrah, 24-Parganas, Khulna and Bankura in South-West Bengal, Malda and Pabna in Northern Bengal; and Chittagong in East Bengal The districts of Eastern Bengal show a Ponderal Index above the average, as also the districts of Northern Bengal with the exception of Pabna and Malda On the whole there is a rise in the Ponderal Index as we travel from South to North The lowest Ponderal Index is for the district of Midnapur, 2 19, and the highest for the district of Tipperah, 2 27.

Oppenheimer's Index

Another formula which has often been used in estimating functional efficiency or the nutritional condition is Oppenheimer's formula, which makes the index of nutrition equal to the girth of the upper arm divided by the chest girth The index should be equal to 30 at least if there is to be no malnutrition according to the European standards. This figure based on the examination of European students is too high to be applicable to our students I have analysed the figures for 200 college students between the ages 17-20, and the frequencies are as follows:

TABLE 9

Frequency Distribution of Oppenheimer's Index.

Index.	No.	Percentage
24	2	1
25	9	4·5
26	32	16
27	43	21·5
28	30	15
29	37	18·5
30	28	14
31	13	6·5
32	5	2·5
Above 32	1	0·5

This gives us an average of 28·1 with a standard deviation of ± 1·732. If we adopt the European standard only 23·5 p. c. of the students would satisfy the test. But if we adopt the average obtained by me, *i. e.*, 28, about 43 p. c. of the students would fail to satisfy the test. This approximates the figure 40·66 p. c. for malnutrition obtained from a consideration of the Ponderal Index. Therefore in the case of the Bengalee student the figure 28 should be adopted. It would not be out of place here to point out that this index gives an idea of the relative development of the muscles of the upper arms as compared with the development of the chest. The smaller the index the slighter the development of the muscular groups. The lower index of 28 as against 30 indicates that the Bengalee student has a poorer development of the muscular system.

It would appear that both the indices are equally

reliable standards for the indication of malnutrition. They are fairly correlated to each other, the index of correlation being 0 5 Oppenheimer's Index does not give us an idea of the different states of nutrition which can be obtained by the use of the Ponderal Index and therefore where time and labour permit, it will be advisable to use the Ponderal Index, which has moreover the advantage of being an index widely used by different workers in different countries The difficulties in calculation can easily be overcome by the use of tables.

CHAPTER III.

On the Rate of Growth of the Bengalee Students

In the 11th Annual Report of the Students' Welfare Committee for the year 1930 it was pointed out that there was not much difference between the Bengalee child and the children of other countries at the age of 7, but from that period onward the Bengalee child constantly lagged behind as far as weight was concerned till at the end of his school career, he was decidedly inferior in weight to the English student though he attained nearly the same height. Further studies brought out the fact that the average Bengalee college student at 19 is much lighter than a student of the same age of any other nation. This finding led me to take up the study of the rate of growth of the height, weight and ponderal index of the Bengalee student as compared with that of students from other countries. I shall first compare the rates of growth in stature of the German, English, Japanese, Philipino and Bengalee students. Of these, the adult Philipino approaches nearest the Bengalee adult average. The Japanese are shorter as a race, whereas the English and the German are far taller than the Bengalees. The figures for the English are taken from the report of the Chief Medical Officer to the Ministry of Health for the year 1927, those for the German, Japanese and Philipino have been taken from Martin's *Lehrbuch der Anthropologie* and the figures for the Bengalee students have been worked out from our own data.

The figures for different age-groups are shown in the following table:

TABLE 10.

(Figures for height in cm.)

Age.	German.	English	Japanese	[illegible]	Bengalee
7	121 5	118	119	117 5	118 5
8	127	122 5	116	117	121
9	132	128	119 5	123	125 5
10	135 5	133	126	124 5	131
11	139 5	138	134 5	130	135
12	145 5	137 5	139	136	144 5
13	150 5	140 5	139 5	140	147 5
14	156	145	139	147	153
15	163 5	154 5	145	154	163
16	166	165	150	158	164
17	168 5	166	155	160 5	165 5
18	171	171	157	161	166

From the above table I find that —

(1) The total gain in height for these nations between the ages 7 and 18, *i. e.*, a period of 11 years is as follows.—

German	...	49 5 cm
English	...	58 cm.
Japanese		45 cm
Philippino	...	47 5 cm
Bengalee	...	47 6 cm

or an average of 49 5 cm in 11 years, *i. e.*, approximately 4 5 cm per year.

(2) The rate of growth is not equal throughout the period. The major part of this increase in height takes place between the ages 11 and 16.

(3) The English, German and Japanese show a further increase in height beyond the age of 16 and in all these cases there is a period of comparative arrest at the age of 12 or 13.

(4) In the cases of the Bengalee and the Philipino the gain in height during the period 11-16 is more or less equally distributed and in both it suffers an arrest after the age of 15 which is more marked in the case of the Bengalee.

The figures for the corresponding weight for these age groups are given below :

TABLE 11.

(Figures for weight in kilos.)

Age.	German.	English	Japanese	Philipino	Bengalee
7	23·7	20·7	19	20·3	21·3
8	26·2	23·2	19·6	21·2	23·1
9	27·8	24·2	21·5	23	24
10	30·6	27·1	23·5	25·5	26·5
11	33·1	29·4	25·9	28·4	28·4
12	37·1	32·4	28·2	31·1	31·9
13	41·6	34·9	33	35·1	36·1
14	46·1	39·1	36·6	41·4	38·8
15	51·7	45·1	42·2	45·4	47
16	56·2	53·6	45·6	47	48·9
17	59·2	55·9	49·7	45·9	49·8
18	63	58·5	50·4	51·2	50·6

Thus the total gain in weight for the different peoples is as follows :—

German	...	...	39·3 kg.
English	...	...	37·9 kg.
Japanese	...	...	32·0 kg.
Philipino	...	...	30·9 kg.
Bengalee	...	...	29·7 kg.

or an average of 3 kg. per year.

(2) The total gain during this period is the lowest for the Bengalee and the highest for the German

(3) The rate of increase is not equally distributed throughout

(4) Between the ages 15 and 18 the normal rate of increase of 3 kg per year, is maintained by the German, English and Japanese students, *but is not found among the Bengalee students.*

(5) Between the ages 11 and 15 the gain in weight among these different nations is fairly equally distributed. The Germans, however, show a greater increase in weight. The Bengalees on the other hand show a smaller increase which is particularly marked in the age-groups 13 and 14.

These two tables considered together lead us to the following conclusions :—

(1) That in the average Bengalee student the progress of growth is arrested at the age of sixteen.

(2) That throughout the growing period, the gain in body weight is proportionately less than the increase in height.

This is very well shown in the attached chart of the Ponderal Indices of these peoples The figures on which these curves are based are given in the following table :—

TABLE 12.

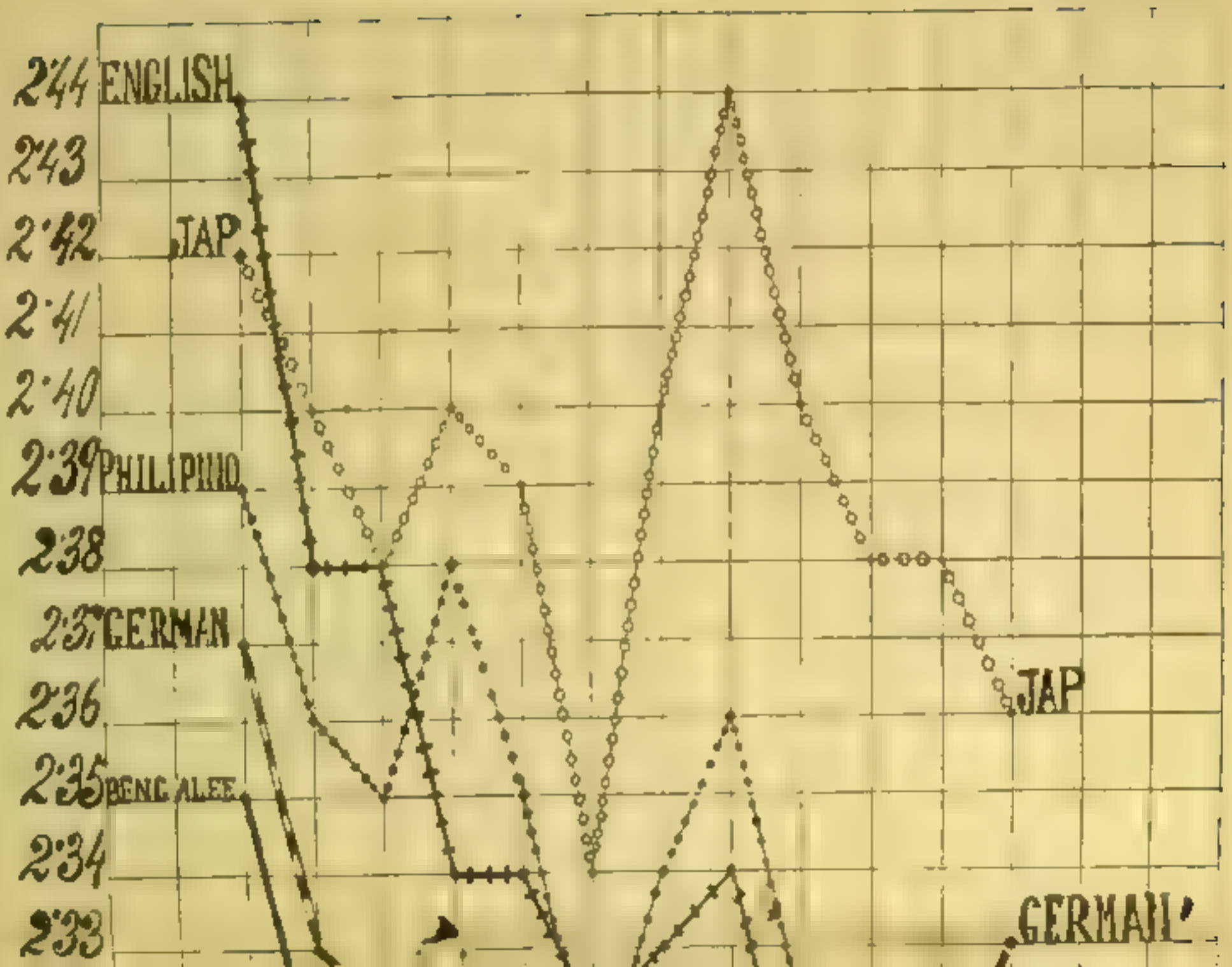
Ages.	German.	English.	Japanese.	Philipino.	Bengalee.
7	2·37	2·44	2·42	2·39	2·[illegible]
8	[illegible]	2·[illegible]	2·39	2·[illegible]	2·[illegible]
9	2·32	2·38	2·384	2·[illegible]	2·[illegible]
10	2·42	2·34	2·36	2·[illegible]	2·27
11	2·30	2·34	2·38	2·[illegible]	2·[illegible]
12	2·29	2·32	2·34	2·[illegible]	2·[illegible]
13	[illegible]	2·33	2·40	2·[illegible]	2·[illegible]
14	2·30	2·34	2·44	2·[illegible]	2·[illegible]
15	2·203	2·30	2·40	2·[illegible]	2·[illegible]
16	2·30	2·385	2·38	2·[illegible]	2·[illegible]
17	[illegible]	2·30	2·34	2·[illegible]	2·[illegible]
18	2·33	2·37	2·334	2·[illegible]	2·[illegible]

The peculiar features of the curve for the Ponderal Index of the Bengalee are—

(1) The steady and unbroken fall of the Ponderal Index throughout the period 7-16.

(2) The absence, in particular, of the sudden rise in Ponderal Index between the ages 13 and 14, shown by the other nations.

As this Index is pre-eminently a nutritional Index and is extremely sensitive to all factors governing nutrition, I am led to conclude that some unusual strain acting about this period, arrests this normal tendency to increase in Ponderal Index among the Bengalees. What this particular strain is, I am unable to specify at present. Most likely it is a combination of the three main factors which adversely affect nutrition, viz., faulty feeding, faulty exercise and overwork. I draw the attention of the guardians and authorities to this phenomenon with a view to impress on them the urgent necessity of keeping their wards in the best possible condition as regards diet, exercise and work during this period.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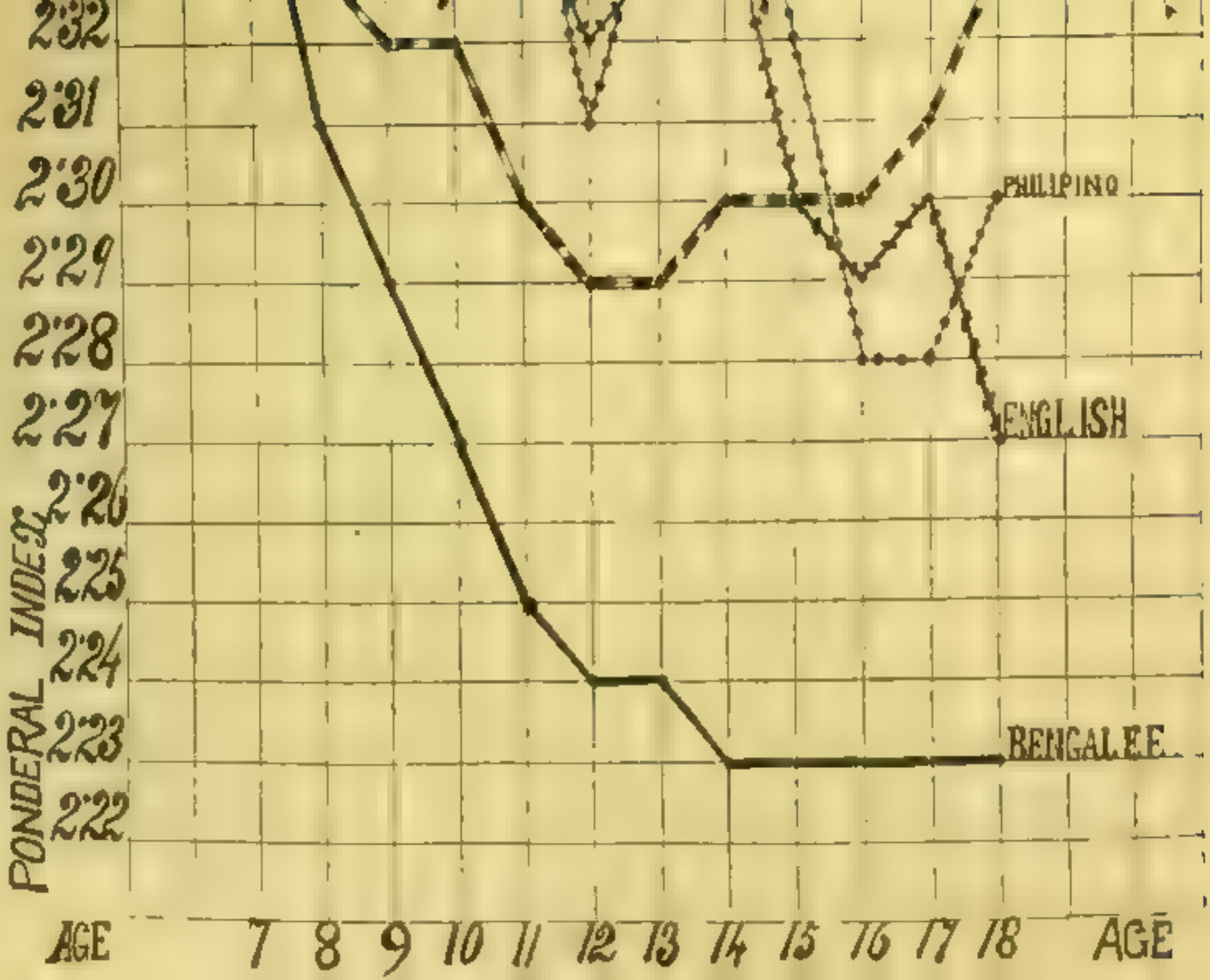
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AGE

CHAPTER IV.

On the Assessment of the Physical Efficiency of the Bengalee Student.

The object of this investigation is the correlation of the relationship of pulse rates under different conditions to a form of physiological efficiency test. "There can be little doubt that in the future resort will be had to physiological tests of physical efficiency. The present anatomical methods do not carry us far enough. It is not merely definite disease we need to detect nor even indications of disease in its early stages, but rather the measure of fitness—to learn the condition of fitness, how by measurable standards it reveals itself; what are the early signs of departure from it, what, more precisely, are the factors leading to lack of fitness when it occurs; how far these are functional or organic in origin, all these and similar questions open up a wide and fruitful field of investigation, and should be one of the primary concerns of the school medical officer." *

At the very outset a standard test for judging the functional capacity of the heart adaptable to the different grades of facilities available in the different colleges had to be devised. Of the different tests advocated for testing the functional capacity of the heart, the *staircase test* seemed to be the one likely to yield the best result. The difficulty in the way of its adoption was the disturbance caused to the routine work of the college by students continually running up and down a flight of stairs. To meet this a modification of the test as usually applied had to be made, and of the several alternatives suggested the following was adopted

* 11th Annual Report of the Chief Medical Officer of the Board of Education for the year 1907, p. 115.

The student was asked to get up and down an ordinary chair, a foot and a half in height, 20 times as quickly as possible, the maximum time allowed being one minute. A medical officer was specially deputed to carry out the test, which was applied to all students excepting those who in his opinion were not in a fit condition to stand the test. The following instructions were issued :—

(1) Examine the heart before exercise, note character, sound, rate, rhythm and murmurs, if any

(2) Put the student through exercise.

(3) Examine heart immediately after exercise, and note rate, change in rhythm or character of sounds and appearance of murmurs.

(4) Ask the student to lie down and examine the heart after one minute Note the condition of the heart and if it has not returned to conditions as in item 1, state the fact ; and

(5) examine the student three minutes after exercise and state conditions.

During the year 1923, 1,200 students were put through this test The number of students reported by the examiners to be unfit to undergo the test was 2.

The results obtained are shown in the accompanying tables.

Table 13

Table showing Increase in the Rate of Heart b at immediately after Exercise.

Rate of Increase	No. of students
Less than 5 per minute	26
21-25	87
26-30	150
31-35	270
36-40	501
41-45	36
46-50	41
Above 50	62

Average 36

The average increase will be found to be 36. In 88 p c of the students the increase in the rate did not exceed 40 per minute.

The largest group of 504 students showed an increase of 36-40 beats in a minute, while a very small group of 26 students showed an increase of less than 20 beats per minute. 147 students, i. e about 12 p.c. of the students examined, showed an increase of over 40 beats a minute.

Table 14.

Table showing the State of Heart 1 minute after Exercise.

No. of Students	Rate of Increase	Percentage
540	0	9
120	2	10
492	4	41
116	6	9
161	8	13
88	Above 8	7

Average 3·9, i.e. 4

From an inspection of the above table, it will be seen that in about 20% of the cases the heart returned to normal within a minute. In 612 students, that is, 51% of the cases, the rate returned to within 4 beats of the rate before exercise. About 7% of the students showed an increase of over 8 beats. In the light of the above findings, the following instructions were issued to assess the physical fitness of the student. A student is not

physically efficient and is not fit for active exercise –

(1) if after the application of the above test the rate is increased by over 10 beats a minute,

(2) if the rate does not fall to within 4 beats of the rate before exercise within a minute.

Age does not seem to have any marked effect on the applicability of the test; the average rate of increase immediately after exercise for ages between 15 and 22 is 36, and the difference in rate 1 minute after exercise in all the age-groups is 4, as will be seen from the following table:—

TABLE 15.

Age	No. of boys	Increase after Exercise	Difference in Rate 1 minute after Exercise.
15	42	36	4
16	152	36	5
17	272	36	4
18	274	36	4
19	212	36	4
20	133	36	4
21	58	36	3
22	30	36	4

In the following tables I have shown the results of the application of the test to students taking exercise regularly, and it will be seen that exercise does not affect the test in any way. The average in their case is the same as for the general group, namely, an average increase of 30 after exercise and a return to within 4 beats after a minute.

TABLE 16.

Exercise's Heart-beat Rate immediately after Exercise

No. of Students.	Rate of Increase.
9	1 –20
6	21—25
27	26—30
48	31—35
76	36—40
8	41—45
7	46—50
11	51 and above
Total 200	Average 30

TABLE 17

Exercise's Heart-beat Rate 1 minute after Exercise

No. of Students.	Rate of Increase.
Nil	0
80	2
110	4
40	6
20	8
10	Above 8
Total 200	Average 4

Certain drawbacks to the application of this test were found out during the year. The most important of these were :—

(1) The disturbance caused to the other examiners by the continuous noise created by students rapidly getting up and down the chair.

(2) The refusal by a considerable number of students to remove their shoes, a procedure which considerably lessened the noise, for application of this test

(3) It was found that it was not possible for a certain percentage of the students to get up and down the required number of times within a minute whereas a percentage of students completed the exercise in a little more than half the time prescribed for the test.

These difficulties caused us to revise the test and the test applied in 1930 to all students above 15 years of age was as follows.

The student was asked to lift a barbell weighing 20 lbs from the ground to the height of his shoulders 10 times without break No time limit was fixed but the examiners were instructed to see that the whole exercise was continuous and without periods of break or rest. This test was applied to 1 516 students during 1930-31. The following table shows the increase in the rate of the heart beat immediately after exercise .—

TABLE 18.

Rate of Increase.	No. of Students	Percentage
Below 20	50	3·3
21—25	104	
26—30	287	79·4
31—35	173	
36—40	399	
41—45	240	
46—50	70	17·3
50 and above	57	

Average 36.

The average increase will be found to be 36. But the incidence in the various columns differ considerably. The group of students in which the increase is 20 and less than 20 is considerably decreased and the incidence of students who showed an increase of over 40 beats is exactly double. This test therefore seems to be a little more strenuous than the one applied before The following table shows the state of the heart 1 minute after exercise :—

TABLE 19.

No of Students.	Rate of Increase	Percentage.
943	0	53 6
503	2	28 2
219	4	12 0
37	6	2 10
19	8	1 09
98	Above 8	5 63

It will be seen that in nearly 54 p c of the cases the heart returned to normal within a minute. In another 37 p. c. of the students examined, the rate returned to within 4 beats of the rate before exercise And in about 7 p. c. of the students the rate showed an increase of 8 beats and over, a minute after exercise.

It will be seen that in this test, the return to the rate before exercise is quicker and more satisfactory than in the first test. The criteria for assessing the physical fitness of the students, however, remained unchanged. A larger percentage of students, i e., 24 p c, failed to satisfy this second test

CHAPTER V

On the Diet and Dietetic Habits of the Bengalees.

Statistical methods in Dietetics have provided extremely valuable guidance and remarkably accurate results have been obtained with regard to the average amount of the different nutrients required by different classes of workers At the instance of Sir W E. Greaves, Kt , the then Vice-Chancellor of the Calcutta University, an enquiry into the dietaries of the different hostels attached to the University of Calcutta was undertaken in 1925 and showed that there was much room for improvement in the food of our student communities as provided in these institutions In most of these institutions the diet did not come up to the minimum standard of requirements There was a general shortage of proteins, (although the shortage in case of one or two hostels was slight only), an excess of carbohydrates in the form of rice, and a marked deficiency in fats. These dietaries suffered considerably in their caloric values which in most cases ranged about the figure 2200

Further enquiries into the dietetic habits of students was undertaken in 1930, as a part of the routine examination by the Students' Welfare Committee and each student was asked to state which of the following articles of food he usually took in his diet and in what quantity. 1,131 replies were received from students and on these the following table is based :—

TABLE 20.

Article.	No. of students.	Percentage
Rice	1,103	98
Wheat	587	52
Ata	1 068	94
Fish or meat	1,009	89
Eggs	248	22
Milk or milk products	(16 to 8 ozs 190 (below 8 ozs 99	17 4 8 4
Fresh fruits	4	1
Sweets	584	52
Tea	4 4	4 1

From the above figures it will be seen that roughly about 25 p. c of the students examined took milk in their diet but less than 17 p. c took it in quantities to meet the requirements of the body and growth. The number of people taking fish regularly was quite satisfactory, but the quantity in which it was taken was very low The habit of taking fresh fruit was fast going out, while a fairly large number took tea and sweets The redeeming feature of these diet reports seem to be the fact that 52 p c. of the students take *atta* or wheat in one of their meals, but this is probably due to the limiting of the enquiry to students residing in the city proper and adjacent districts The deficiency of fats in the food particularly fats of good nutritional value was marked, for the quantity of *ghee* taken was infinitely small in amount From the above remarks it can easily be inferred that the nutritive value of the present-day diet of the Bengalees has been considerably lowered in many respects—in its protein and vitamin contents, in the unbalanced proportion of the different constituents proteins, carbohydrates and fats and lastly in its energy value.

In Chapter II I just touched on the influence of diet on growth. It would not be out of place here to collect all available data regarding the Bengalee diet and its

influence on the health and growth of the people McCay investigated the dietaries of two groups of students—Anglo-Indians and Bengalees, living exactly under the same conditions, the only difference being in the matter of food. The Anglo-Indian students consumed on an average 3·5 ozs. of protein daily, the Bengalee students did not get more than 2 ozs. The difference in the physical development of the two groups of students during the 3 years they were under observation was very striking, the results obtained are shown in the following table :—

TABLE 21.

Nationality	Number of Students	Average Increase in Weight	Increase in Chest Measurement + Weight	Average Increase in Height	Average Increase in Stature
Anglo-Indian	[illegible]	[illegible]	[illegible]	[illegible]	Marked
Bengalee	[illegible]	[illegible]	[illegible]	Negligible	Nil

It will be seen that Anglo-Indian students gained considerably in weight, height and chest measurements. In the case of the Bengalee students the gain was insignificant and negligible, and in fact 42·8% were reduced in weight. McCay concluded that protein insufficiency in the daily diet was responsible for the retardation in the physical growth of the Bengalees.

Recent investigations into the dietaries of the people of different provinces of India by Col. McCarrison have shown that the food taken by the people of Bengal and Madras compared most unfavourably in their nutritive values with those of other provinces in India. The Punjab diet of whole meal, *atta*, *dal*, vegetables and milk with the addition of meat twice a week is the best of all Indian diets, and no wonder that the Punjabees form

one of the finest specimens of the human race in the world. Next in order comes the Marhatta diet. The Gurkha diet stands third in order of merit The Bengal and Madras diets consisting chiefly of rice and nominally of *dal* and other protein-containing elements are the worst, so far as their nourishing value and vitamin contents are concerned, and it is not surprising that the people of these two provinces stand low in the matter of their physique and physical qualities.

In dealing with the distribution of Ponderal Index in the different districts of Bengal, I have shown that this Index is higher for the districts of East Bengal than for West Bengal This affords another instance of the relation between the quantity of protein daily ingested by the people and the standard of health and vigour maintained by them. The amount of protein available in the daily diet of the East Bengal people is 2·5 ozs and that of West Bengal 2 ounces. (*Diet* -Chunilal Bose)

In the chapter on Nutrition I gave a detailed analysis of the influence of diet on the Ponderal Index and showed that the addition of wheat only to the normal Bengalee diet did not affect appreciably the Index ; but the addition of milk in sufficient quantity markedly raised the Index, and the addition of both milk and wheat gave the best results This is quite in agreement with the conclusions arrived at by recent workers such as Mendel, McCallum and others in their experimental work on Nutrition.

In the application of the principles of Nutrition to human dietetics where there is an abundance of food-materials to choose from, it would be safe, provided the necessary vitamins are present, to follow Bayliss advice to take care of the calories and allow the proteins to take care of themselves On the other hand where the food-supplies are restricted as in the case of the average

Bengalee care must be exercised in the selection of proteins as well as of the various other constituents of the diet.

The complexity of the problem of a standard diet becomes increasingly difficult with growth of knowledge. Practical dietetics depend on several factors, the exact relative importance of which cannot perhaps be gauged in every case, but preparation of food so as to make it appetising must undoubtedly rank high.

In discussing this problem further I feel justified in quoting extensively from the work of Rai Bahadur Chunilal Bose "The question of improving the diet is a difficult problem having regard to the fact that improvement in dietary would necessarily mean increased expenses which the average Bengalee cannot easily afford Educating public opinion in the matter of proper dieting will go a great way in effecting the needful reform. People must be made to understand that what they now spend on food is hardly enough to maintain them in health or to give them strength, and that a little more expense under this head will benefit them in the long run by increasing their capacity for work, and decreasing their susceptibility to attacks of diseases They must be made to learn the comparative nutritive values of the various food stuffs in daily use and how by a little manipulation, in the way of substitution and modification, these could be so combined as to ensure a more improved dietary without necessarily increasing the cost Centres should be opened in all parts of Bengal to successfully carry out this propaganda work This should also form a part of the course in Elementary Hygiene and be included in the curriculum of studies both for boys and girls in all schools in Bengal."

The problem of the standard dietary still remains largely unsolved and the complexity of the subject becomes

increasingly difficult. But a few suggestions can be made in this connection One of these suggestions is the substitution of whole-meal flour for rice, in one of our two principle daily meals. "A mixed diet of rice and chappatis both for the morning and evening meals will go a great way towards balancing the diet without coming into conflict with the habits of long years. It will improve the quality of the diet, at the same time reduce its bulk The addition of a little more Dal to the daily diet of the Bengalees will considerably enhance its Protein and vitamin B contents The faulty way in which rice is cooked and eaten by the *Bhadralog* classes in Bengal should also be corrected. The rice water is generally thrown away and the salts, vitamins, and part of the Protein in rice are thus lost. This is a regular economic drain on the financial resources of the people and is also injurious from the point of view of health. Rice should be so prepared as to retain the water in the boiled grains. Formerly it was a universal practice with the old and the young of Bengal in every household to take as the first thing in the morning a handful of soaked and softened grams either with salt and ginger or with *Gur*. This practice has practically been given up and a cup of tea with or without biscuits has taken its place. Needless to say the change has not been for the better. The practice should be revived and sprouting grams should be our daily food in the morning preferably with *Gur*. There is no harm in taking a cup of tea along with it. The re-establishment of this practice will to some extent make up the deficiency in Protein and vitamin in our present day Bengalee diet. A larger inclusion of green leafy vegetables in our daily diet is urgently called for. It is from this source that we can secure an adequate supply of vitamin A and C which are essential for growth and for protection of body from

infectious diseases. The *sak* (leafy vegetables) is usually condemned as food fit for cattle; this is an objectionable prejudice which should be got rid of. In carrying out the reforms suggested above practically no extra expenses are involved But these alone will not solve the vexed diet problem in Bengal. In order to fully make up the deficiency in Protein and to improve its quality generally there should be a more liberal allowance of Protein foods of animal origin in the present-day diet of the people. The best way in which this can be done is by providing more milk, fish, meat or eggs in the daily diet. Those who can afford it should increase meat or fish in their diet to at least 5 ounces in their daily ration. The present-day Bengalee daily diet would be greatly improved by the addition of one or two eggs daily to it There is an ill founded prejudice against the use of eggs which should be got over. The popular belief that consumption of eggs gives rise to gouty or rheumatic troubles does not find support in scientific study or in experience Eggs are held to be free from purin bodies. Duck's eggs are as good as hen's eggs, besides they are cheaper and yield a larger quantity of nourishing materials." (*Diet*—Chunilal Bose.)

The all-important subject of food economics can receive but little attention here It is needless to point out that it is a question which must be carefully considered in the solution of all problems of dietetics The average Bengalee *bhadralog* has an income hardly exceeding Rs. 40 a month. His family usually consists of 2 adult members and at least 3 children After meeting various demands on his income in the shape of rent, school fees, clothes, milk for the baby, etc., he finds that he has something less than twenty rupees to feed 2 adults and 2 children, i.e., 3 adults. The problem before us therefore is to devise a *suitable standard dietary, adapted*

to the habits and customs of our people, the cost of which may be within the means of the average Bengalee clerk, i.e., not exceeding Rs 7 per month per head The late Rai Bahadur Chunilal Bose devised a standard dietary which I reproduce below :—

TABLE 22

Article	Ounces	Proteins in grammes	Carbo-hydrates in grammes	Fats in grammes	Calories	Cost according to present (1939) bazar rate in pice.
Rice	6	8·52	141·7	1·38	614	3 150
Atta	10	33·0	300·0	6·00	964	6 750
Dal	3	9·1	47·7	1·05	278	3 375
Fish	8	21·7	0	1·50	107	22 500
Potatoes	6	1·0	11·8	0·10	162	6 750
Vegetables	8	3	2	0·10	80	4 500
Ghee	½	0·0	0·0	14·50	130	5 125
Mustard oil	1	0·0	0·0	28·00	252	9 675
Sugar	1	0·0	28·1	0·00	115	1 875
Salt Spices	As required	—	—	—	—	1·00
		82·12	662·3	54·63	2837	67·6 pice

Approximately Rs. 9-8 per head per month.

It will be seen that the above standard is beyond the reach of the average people, moreover the table is slightly defective in the fact that one-third of the total proteins is not derived from animal sources. To meet these two objections I drew up a series of diet tables and the one which approaches nearest to the solution of the above problem is shown below :—

TABLE 23

Articles.	Ounces	Proteids in grammes	CH in grammes	Fats in grammes	Calories	Cost according to present [illegible]
Rice	6	[illegible]	141.6	[illegible]	[illegible]	[illegible]
Atta	10	33.00	190.0	6.00	964	[illegible]
Dal	3	[illegible]	42.7	1.55	[illegible]	[illegible]
Chhana	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Eggs	4	15.20	[illegible]	[illegible]	[illegible]	[illegible]
Potatoes	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Green vegetables	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mustard oil	1	0.00	0.0	[illegible]	[illegible]	[illegible]
Gur	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Salt } Spices }						[illegible]
		[illegible]	[illegible]	[illegible]	2785	[illegible]

Approximately Rs. 7-8 per head per month.

i.e., just beyond the reach of the average middle class Bengalee. It is needless to mention that the above table does not satisfy all the various tests applicable to a standard diet but it has the merit of providing a sufficient quantity of proteins, nearly a third of which is derived from the animal world.

Its main defect is that it does not leave a sufficient margin for the preparation of a variety of dishes, by the substitution of eggs by fish or meat for more than once a week. The monotony of this in spite of good cooking, an art in which the Bengalee housewives pre-eminently excel, is likely to affect the palatability of the dishes, and thus make them less appetizing and therefore less digestible.

It is slightly deficient in its calorie value and also in its fat contents, especially fats of good nutrient value. The addition of ½ oz of *Ghee* to the daily ration, would not only correct these errors, but would also serve as a great boon to the housewife in enabling her to provide for a variety of dishes the necessity of which cannot be over-stressed but it would increase the cost by As. 13 per head per month.

Finally the quantity of rice and *atta* recommended for daily consumption is rather large and it is highly probable that a considerable proportion of the middle class Bengalee will not be able to take in the required bulk. This would take away considerably from the value of the diet and perhaps make it useless as a guide The inclusion of these two articles in quantities recommended is on economic grounds. Attempts to reduce their bulk will lead to a proportionate increase in the quantities of fish or meat and *ghee* to be daily taken and considerably raise the cost of food per head per month.

For those who are better situated financially the following modification will be found to be better suited to the habits and tastes of the Bengalee :—

Rice, 4 ozs.
Atta, 10 ozs
Dal, 3 ozs.
Eggs, 4 ozs. (two).
Meat (goat's) or fish, 2 ozs
Potatoes, 4 ozs,
Green Vegetables, 8 ozs.
Ghee, ½ oz
Mustard oil, 1 oz.
Gur, 2 ozs.
Salt and Spices, as required.

The above diet supplies approximately 92 grams Proteins, 427 grams carbohydrates and 71 grams fats and has a calorie value of 2750 at a cost of Rupees 8-10 per head per month.

Those who are in affluent circumstances can further modify the above diet by reducing the quantity of *atta* to 8 ozs and increasing the intake of fish or meat and *Ghee* to 4 ozs and 1 oz per head per day respectively. These modifications will increase the average cost to Rs 11 per head per month The further addition of 8 ozs. of milk to the above diet at a cost of Rs 2-8 per head per month would raise the protein, the vitamin, the mineral contents and the calorie value of the diet to a level which would leave an ample margin for all unforeseen demands.

But all these circumstances are beyond the point and I must frankly admit that I have failed in my attempt to devise a diet suited to the financial capacity of the average Bengalee clerk who can spend only Rs. 7 per head per month on food. My apology for publishing the above tables is the hope that they may prove of some use to others interested in the question and may perhaps help a critic in discovering the modification which will solve the problem.

Thus it will be seen that the science of nutrition is not a mere body of rigid doctrines but involves racial and national customs and the question of the availability of food The question of a standard diet remains largely unsolved. But the broad fact emerges that adequecy of diet can be attained by aiming at moderation in quantity and variety in character, and insisting on the importance of green vegetables, raw fruits, and dairy produce

Adulteration of food

It would not be out of place to point out here that utmost care should be exercised in procuring articles of food in their purest

condition. If the quality of these articles are at fault, their values as food are considerably altered and diminished Adulteration should be strictly guarded against and in the interest of the health of the nation no safeguard against it should in the least be relaxed.

Section 407 of the Calcutta Municipal Act,, 1923 prohibits the sale of certain articles of food which are not of the prescribed standard of purity. The list includes such articles of food as milk, *Ghee*, wheat flour, butter, mustard oil, tea, edible oil or fat, etc. Heavy penalties have also been prescribed against persons contravening any provisions of the said Act. But in spite of these laws and regulations adulteration of food-stuffs is the rule rather than the exception in Calcutta; so much so that it is well nigh impossible to procure pure samples of the articles named above.

This state of affairs cannot wholly be due to the apathy of the public or the negligence of the Corporation. The difficulties in the way of checking food adulteration seem to be very great. The standard of purity of food-stuffs has been fixed so low that 20 per cent of adulteration can be passed off easily without being detected. Adulteration of *Ghee* and mustard oil to a certain extent cannot be detected as such adulteration only reduces their purity values from the maximum to the minimum. Till recently the Municipal Act had no definition for edible oils The Calcutta Municipal Amendment Act of 1932 has defined edible oils, but as there is no section in the amendment by which a seller can be compelled to describe the edible oil, he still goes on selling adulterated mustard oil as edible oil and thus evades the penalty of the law. No standard has yet been fixed for the common Bengalee sweets, *e.g., Sandesh, Gaza*, etc., with the result that if during their preparation, some constituents other than their normal ones are mixed, the

food-stuff thus prepared cannot be called adulterated Finally Section 418 of the Calcutta Municipal Act of 1923 is defective in as much as it does not entitle the Corporation to compel the dealer to open a box or an almirah which is kept under lock and key and wherein the food inspector suspects that some adulterated or unwholesome food-stuff is stored. These facts and limitations make it very difficult for the Corporation to take legal proceedings against the dealers of adulterated food. The result is that adulteration is openly rampant in the city. The evil urgently calls for a change of the existing laws. Adulteration of food-stuffs in any form whatsoever should be made illegal and punishable.

In the meantime the public can bring about the suitable atmosphere needed for this change by patronising only those dealers who do not sell adulterated articles of food, and by starting a movement for the amendment of the present laws.

CHAPTER VI

On the Physical Activities and Pursuits of the Bengalee Students

By tradition and culture, the Bengalee student does not take kindly to strenuous games and athletic sports. Various ingenious explanations have been advanced to explain this aversion, *but the obvious reason—the want of proper food*—has been either overlooked or put into the background. "A well-fed horse will work and a well-worked horse will feed" is an adage which is to the point in the case and pithily explains both the aversion for exercise and the prevalence of digestive troubles among the Bengalee students. It is a case very similar to that of the starving beggar who was offered work by a kindly housewife and preferred to die instead of working, a case where the spirit is willing but the flesh is weak. Our first endeavours should be directed to the feeding up of the Bengalee child and then to give it work.

The educational activities in Bengal up till recently has been very much one-sided. The culture or education of the body has been absolutely neglected for the sake of the education of the mind. A student who took any interest in strenuous games or exercise was nicknamed a 'Goonda' and was regarded by his co-students as a person to be avoided and by his people at home as a blot upon the fair name of the family. Is it a wonder that under such circumstances and environment the physique of the Bengalee has deteriorated from decade to decade?

An enquiry into the habits of the students showed that only 31 p c of the students residing in Calcutta took exercise regularly and about 25 p c took part in organised games and that nearly 30 p c of the students did not take part in any games or indulge in any form of physical culture Playing fields are not easily available in Calcutta and facilities for organised games offered by schools and colleges except in a few cases are negligible Most of the institutions levy from the students an athletic or sports fee, but here again the arrangements for imparting proper physical training under qualified instructors are non-existing except in a few institutions

The sportsman who will not be denied physical exercise of some sort or the other is left to himself to devise his own form of physical exercise He is unacquainted with the true aims and ideals of physical training or the proper methods of physical culture The result is that in many cases he indulges in forms of exercises which are not suited to his constitution or are too strenuous for his age and thus unwittingly does great harm to himself.

It is a welcome sign of the times that the Educational authorities have at last realised the seriousness of the situation and are giving up their attempts to build a supermind in an infirm body. Some sort of physical exercise has been made compulsory for all 1st-year students attending colleges and a University Athletic Club has been formed to govern and regulate the major games and athletic activities of the students. The University has at a considerable cost run a Rowing Club for the last 13 years to encourage this form of sport and has handed over the management of the club to a representative committee from the colleges to popularise it among the Bengalee students Considerable financial help was also given to colleges who applied for such help

for improving their playgrounds and for properly fitting up the attached gymnasia during the years 1927-29. The Calcutta University has approved of a scheme for the establishment and working of a model gymnasium with a Director of Physical Education at its head. The All Bengal Teachers' Association have also taken up the work. They have started training classes for Physical Instructors attached to schools under the guidance of expert physical culturists and lately the Government of Bengal has recently opened a school for the training of Physical Instructors under the able guidance of James Buchanan, Esq., Physical Advisor to the Government of Bengal. The All Bengal Physical Culture Institute is also doing good work under the capable guidance of such well known experts as Captain J. N. Banerjee, Mr. Rajen Guhathakurta, and Mr. J. K. Seal, whose zeal for popularising the art of self-defence among our students deserves encouragement and recognition. The work of the different Y. M. C. A. organisations, in making us familiar with the different systems of physical culture in vogue in America and the varieties of in-door and out-door games which can be played in small open spaces deserves notice. In the field of introducing novel recreations our own people have not lagged behind. Efforts are being continually made by various private bodies to revive and popularise the old Indian games. In this connection we cannot afford to forget the work of G. S. Dutt, Esq., in reviving the folk dances once so popular in the different parts of Bengal. Students have also responded nobly to this call for proper physical training and schools which have started classes for physical training for boys are hard pressed to meet the constantly increasing demand of students for further activities. The greatest difficulty which stands in the way of proper organisation of suitable physical activities in Calcutta,

is the want of play-grounds. The schools are in the majority of cases too poor to purchase play grounds of their own. The Improvement Trust and the Calcutta Corporation are the only bodies which can solve this problem for the city of Calcutta by coming to the help of the schools, by building new parks and play grounds solely for the use of school students, during and after school hours and by throwing open the existing ones for the use of the students during school hours between 12 Noon and 5 p.m. This procedure if adopted will undoubtedly cause a considerable stir among the rate payers residing about the parks and the corporators will have to face considerable criticism and opposition. But considering the fact that the richest asset that a nation can possess is the health and fitness of its rising generation, I hope that the city fathers will not be afraid to take the necessary steps to throw open these parks for the use of students.

All these are very hopeful signs and the progress which is being made is gratifying. But I am afraid that in our endeavours to make up for the neglect of physical culture for the last 50 years, we are moving too fast to allow the inborn body of the Bengalee student to accommodate itself to the new conditions. Strenuous games, *e.g.*, football, are being played even in far off villages by immature boys totally unfit to stand the strain. Heavy exercises with barbells and weight-lifting, etc., are being indulged in by youthful students whose bones have not as yet developed sufficiently to stand the strain; and young boys without proper training are being encouraged to go down into the pit of athletic competitions. The baneful results of these unguided and uncontrolled activities are already manifest. In the world of football where Bengal held a position of high honour and gave promise of even greater achievement the standard of

play has been declining from year to year. In the world of athletics but a few years back the Bengalee athlete played a no mean part, but during recent years he has only failures to his credit. Formerly it was not rare for college students to maintain their form and standard for a number of years, but of late they shoot across the firmament like meteors and vanish from the world of sport before they are well started. These facts should set us thinking seriously. In my opinion, if we are to regain the lost place a campaign for going slow should be started immediately. *The importance of proper training should be emphasised and young students should be forbidden to indulge in the strenuous parts and strenuous exercises.* They should be made familiar with the true ideals of physical education, and facilities for proper training should be given to them and instructors should insist that every aspirant shall have to undergo a course of proper training.

I shall conclude this study with a summary of the methods and ideals of physical culture. "A stereotyped form of exercise will not benefit the vast majority of students. It is highly unscientific to put every one through the same set of exercises. Some children are only fit for modified exercise or for some game or pastime which does not put an undue stress on any doubtful or damaged organ. They will improve physically in every way by such regulated exercise but they are not fit to go down into the pit and experience the joy of strenuous athletic competitions. Other children will be found fit for some of the less exacting games and others will be ready to take on those games and sports which are the most strenuous of all and reap physical benefit and health from participation in them. No rules can be laid down setting forth which games and which sports are fit for different children of definite ages. In this matter it is necessary

to every case study the individual when it comes to a question of what games and sports he may or may not attend.

"Every child before it is allowed to take part in real hard games, *e.g.*, hockey, or football, or to compete in sports should be encouraged to train and to get as fit as possible. Training should be gradual and be pushed as strength and stamina increases, beginning very easily. During the whole period of training it should be carefully watched to see that development takes place on right lines and above all things good style should be cultivated. Good style means the attainment of the object with the least possible expenditure of force.

"No game or sport is really of much worth unless it is necessary to train and prepare oneself for it. The training is of the greatest value, it teaches self-control and self-sacrifice, it helps in the formation of character and makes the will control the body. The next most important thing is the struggle; the joy of the contest and the knowledge that you are doing your best, whatever the result may be and last of all is the win. The win is very nice, to excel is excellent but it does not produce the good effects which are the result of the preliminary training and joy of the struggle to excel. In individual contest the great thing is to inculcate gameness; not to give up when feeling done, but to fight it out to the bitter end. This gameness will help the boys to carry on in the same way in their intellectual work as in the greater affairs of after life as they did when they were running or playing and declined to know that they were beaten." (*The Health of the School Child*—various authors, Oxford Med. Pub.)

Here I would like to mention one point regarding the press and sports. We all know the debt which sport owes to the *press*. But sometimes the press goes too far in

unduly booming immature precocity. If a boy does a good performance let it be recorded, but the public press should not lay too much stress on it as it usually causes a swelled head. Instances are not rare in our country of extreme promise in youth nullified owing to injudicious and premature overpraise by the public press. Lastly it must be remembered that the aim of true physical culture is not to build up large muscles comparable to that of the strongest or to develop a speed surpassing that of the fleetest but to develop a body every part of which will be in perfect proportion and every portion of which will act in perfect harmony with each other and the brain. The beautiful lines of *Kipling* sums up the whole case:—

"The even heart which seldom stirs its beat,
The cool head weighing what that heart desires,
The measuring eye that guides the hands and feet,
The soul unbroken when the body tires,
These are the things our weary world requires
Far more than superfluities of wit.
Wherefore we pray you, sons of generous sires,
Be fit, be fit, for honour's sake be fit!"

CHAPTER VII

On the Effect of Overwork and Strain

I will now attempt to gauge the amount of strain, both mental and physical, which is put on the Bengalee school student during the most tender period of his life. I have not attempted to express the strain in measurable units as a fair idea can be formed about it by calculating the average period of school attendance, the average period of study at home and the average period of recreation. Information about these was collected from over two thousand students and the following averages were obtained. The average period of sleep enjoyed by the boys is 8·25 hours, the average period of study is 3·67 hours, the average period of attendance at school is 5 hours and the average period of play is 1·5 hours per day. Even to a casual observer the period of attendance in school will appear to be unnecessarily long. This strain is further enhanced by the fact that in most of the schools, there is no recess between the periods. Even in the best managed institutions the necessity of breaking the strain by periods of rest is not fully recognised and only one recess of twenty minutes to half an hour is allowed. The second factor which inflicts a very great strain on our boys is the imparting of education through the medium of a foreign language which is extremely difficult. The educational authorities of the country and the people have long realised this defect and have made several attempts to remove this handicap from our students and it seems as if their efforts will at last bear fruit.

Not only is the length of school attendance unnecessarily long but the part of the day during which this compulsory attendance is exacted, is wholly unsuited to the climatic conditions prevailing in our country. Only in winter is this season of the day comfortable. During the rest of the year it is more or less a sort of a penance. The habit of years, accustomed to a cool climate, where this portion of the day is the most comfortable and exhilarating and the best suited for work, has been forced upon us and we have been left to adapt ourselves to this change however best we can. In the tropics Nature herself reduces her activities to a minimum during this period, and she is having her revenge for the breaking of her laws by undermining the health of the younger generation and stunting their growth both physical and mental. The third factor in keeping up and magnifying the strain is the neglect of the parents and guardians regarding the health of their wards. Defects of vision, dental caries, and anaemia, which should receive the earliest possible attention and treatment to enable the student to reap the maximum benefit from their education are allowed to progress until they cause irreparable damage, even when these defects are pointed out to the guardians, their evil effects, expenses and facilities there for their removal or treatment. This is a state of affairs extremely difficult of solution and can only be solved by a proper and increase of knowledge among the people. What can we do to remedy these defects? The excuse for the long attendance in schools has so long been the difficulty of teaching boys in a foreign language. This will be shortly removed and the keeping up of the strain will no longer be justified, even before it was not necessary and was not put on the student in schools managed by some of the missionaries and Unaided authorities. In these institutions an average attendance of 22 hours per week was

found to be more than sufficient to give the students an education up to the standard laid down by the University and even beyond it. If it was so formerly there can be no justification in enforcing a longer attendance.

Another reason for the keeping up of long hours of compulsory attendance in school, is the grouping of students of different mental calibres in the same class. It is the result of attempts at bringing the backward students up to the minimum level of efficiency required by the University. It appears to me to be a faulty system for the mental age of a child is not dependant on the length of attendance at school. It throws an additional strain on the backward student who in spite of his best endeavours finds that he cannot keep up with his brighter companions. It equally hampers the progress of the intelligent by denying to them full play of their powers and intellect and forcing on them hours of idleness. It is highly unscientific to attempt to fit every one to the same bed of Procustes and is an unwholesome practice which should be done away with as early as possible.*

The best time for work in this country is the early hours of the morning from 7-11 A.M. But this question of completely changing school hours cannot be entertained for the present as it will clash with the newly acquired habits of the people. But considerable relief could be given to the younger generation by a sensible adjustment of the school routine. Short periods of break of 10 to 15 minutes should be introduced after each hour of work to allow the students to stretch their tired and cramped limbs and refresh their perplexed and jaded minds. A period for refreshment for at least half an hour should be put in at the end of the second hour of work and this

* I am indebted to Mukund Pada Ray, Esq., B.A., Asst. Head Master, Mitra Institution, Bhawanipur, for bringing to my notice this cause for the maintenance of long school hours.

should be followed again by a third period of recess at the end of the third hour. The grouping of the lessons should be so arranged that the more difficult subjects, *viz.*, English and Mathematics, would be dealt with either at the beginning of the day or immediately after the break for refreshment when the students return with a refreshed body and mind and the last hour should be devoted to light work, *viz.*, Vernacular, Elementary Science, or to Vocational and Physical Education, subjects which being completely novel will act as a stimulus to the mind of the students.

It should always be remembered that the last four years of school life is the critical period in the life of the individual. It is a period during which the growth of the individual is most rapid. It is the period during which the body and mind are struggling to adjust themselves to changed conditions of a new and unknown world of thought and expectations. Any undue strain, however slight it may seem, is likely to do incalculable damage to the physique or the mind of the student. It is the period during which it is absolutely necessary to place these young people in the best possible environment that is available. *Unfortunately for the nation this period exactly coincides with that stage of education where the greatest amount of pressure is put on the student* and the result is that deplorable state of health and physique, yearly brought to light by the annual reports of the Students' Welfare Committee.

Conclusions.

I have dealt with the various aspects affecting the health and growth of the Bengalee students in the preceding chapters in details and also suggested measures which will alleviate these to a certain extent. The

following summary will give an idea of the extent of the problem :—

1. A medical examination shows that out of every 10 students examined only 3 are perfectly fit and healthy for thier age; 6 are definitely on an infirm plane of health and strength either from some disability or some failure of development, and the remaining one is quite incapable of undergoing more than a very moderate degree of physical exertion and can almost be described as a physical wreck.

2. The absolute weight of the Bengalee boy is alarmingly low. The average of 52 kg. is about 18 kg. or 39 lbs. or 25 p. c. less than the average Western standard. The specific weight or Ponderal Index is about the lowest obtained for the various peoples mentioned in the body of the report.

3. The capacity for chest expansion is markedly low; on the average over one inch or 33 p. c. lower than the average European standard.

4. The vital capacity is markedly low; 14·8 p. c. lower than the European mean.

5. There is nearly a complete arrest of growth after the age of 16.

6. Throughout the developing period the increase in weight is proportionately low as compared to height.

7. About 24 p. c. of the students are not physically fit to stand even a moderate amount of exercise.

8. There is a general aversion to strenuous games and exercises and nearly 36 p. c. of the students do not join in any form of sports or physical exercise.

Some of the factors which have brought about the above state of affairs seem to be—

(1) The faulty nature of the Bengalee diet which is poor in suitable proteins, vitamins, mineral elements and

fats of good nutritional value and is too rich in carbo-hydrates.

(2) The lengthy attendance in schools and colleges; the hours of attendance are unquestionably long and in most cases continuous.

(3) The strain on the students due to a foreign medium of education.

(4) The want of proper and suitable physical culture.

(5) The general neglect of health due to ignorance of the general laws of health.

(6) The selection of the wrong hours for work, i. e., the hottest part of the day.

The main factor at the root of all our troubles is the very low economic position of the average Bengalee *Bhadralog*. This factor is beyond the province of this review, and has not been dealt with.